Mathematics

Year 11 Higher
Scheme of Learning

Subject leader: K Ellender

Topics by term	Topic overview for Year 11					
	Term 1	**Term 2**	**Term 3**	**Term 4**	**Term 5**	**Term 6**
Topics taught	**13H Further Trigonometry** 13.a. Revision of Trigonometry 13.b Trigonometry with accuracy. 13.c. Area of a triangle, Sine Rule, Cosine Rule 13.d. 3D trigonometry 13.e. Trigonometric graphs Knowledge Recall and Quiz	**15H Equations and Graphs** 15.a. Linear functions 15.b Quadratic functions 15.c Simultaneous equations 15.d Cubic functions 15.e Graphing inequalities Knowledge Recall and Quiz **16H. Circle Theorems** 16.a Identifying theorems 16.b Application of theorems with reasoning. 16.c Equation of a circle. Tangent to a circle and gradient. Knowledge Recall and Quiz **Mock Examinations**	**17H Further Algebra** 17.a Changing the subject 17.b Algebraic fractions 17.c Quadratic Sequences 17.d. Surds 17.e Functions 17.f Proof Knowledge Recall and Quiz **Mock Examinations** **19H Proportion and Graphs** 19.a Proportion 19.b. Exponential functions 19.5 Non-linear graphs **18H Vectors** 18.a Vector Arithmetic 18.b Geometric problems Knowledge Recall and Quiz	*End of Year Revision and Exams*	*End of Year Revision and Exams*	*End of Year Revision and Exams*

		Vital prerequisites	Vital prerequisites	Vital prerequisites	Vital prerequisites	Vital prerequisites	Vital prerequisites
		Year 9 Term 6 **6H. Angles and trigonometry** 5a. Triangles and Quadrilaterals 5b. Angles in polygons 5c. Pythagoras' Theorem 5d. Trigonometry – lengths 5e. Trigonometry – angles	**Year 9 Term 5** **5H. Graphs** 6a. Linear Graphs 6b. Graphs of Real Life & Rates of Change 6c. Line Segments 6d. Quadratic Graphs 6e. Cubic, Reciprocal and Other Graphs **Year 10 Term 2** **9H – Equations and Inequalities** 9a . Solving quadratics 9b. Completing the square 9c. Simultaneous equations 9d. Linear and quadratic simultaneous equations. 9e. Solving inequalities	**Year 9 Term 2** **2H. Basic Algebra** 2a. Algebraic Indices 2b. Expanding brackets and factorising 2c. Solving Linear Equations 2d. Sequences 2e. Expanding and factorising quadratics 2f. Substitution and formulae **Year 10 Term 2** **9H – Equations and Inequalities** 9a . Solving quadratics 9b. Completing the square 9c. Simultaneous equations 9d. Linear and quadratic simultaneous equations. 9e. Solving inequalities **Year 10 Term 4** **11H - Multiplicative Reasoning** 11a. Multipliers-Growth & Decay 11b. Compound measures 11c. Direct and inverse proportion **Year 11 Term 2** **15H Equations and Graphs** 15.a. Linear functions 15.b Quadratic functions 15.c Simultaneous equations 15.d Cubic functions 15.e Graphing inequalities			
		Why are we teaching this now?	Why are we teaching this now?	Why are we teaching this now?	Why are we teaching this now?	Why are we teaching this now?	Why are we teaching this now?
		Leads into A-Level Curriculum covering deeper Trigonometric Identities and Equations	**Leads into Term 4 Year 11 work on non-linear graphs and proportion. Also provides a basis for the Year 12 Pure Maths curriculum, which develops into transforming functions and more complex graphs.**	**Considered core Algebra skills for taking Maths into A-Level. This topic provides a strong foundation in Algebraic Manipulation, essential for success in KS5.** **Vectors provides a foundation for KS5 Mechanics in the Applied element of the A-Level.**			

Contents

This symbol indicates that there are aspects of this curriculum area that pupils have previously practised. Pupils will be revisiting earlier content as part of their consolidation or in order to ensure knowledge is secure before expanding into new learning. References to these earlier SOL are noted for teachers to check specific objectives and content.

Specification References	Big questions	Topic area: Main Items	Learning Objectives /Outcomes All: grades 4-5 Most: grades 6-7 Some: grades 8-9 Examples	Key Terms/ concepts Literacy Numeracy	Assessment and homework tasks	Resources	Personal Development Curriculum links (SMSC, British Values, PSHE)
Term 1							
		Topic 1: Ch13H - Further Trigonometry (6 weeks)					
A4, N7, N8, N15, G6, G20, G21, N16, G11, G22, G23	How do we apply trigonometry knowledge to any triangle? Yr9 Ch5	13.a Revision of Trigonometry 13.b Trigonometry with accuracy. 13.c Area of a triangle, Sine Rule, Cosine Rule	**Revision from unit 5H:** Calculate missing lengths and angles using Pythagoras' Theorem and the Trigonometric Ratios Know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60° and 90°; know the exact value of tan θ for θ = 0°, 30°, 45° and 60°. Use upper and lower bounds in trigonometry calculations. Know and apply Area = ½ ab sin C to calculate the area, sides or angles of any triangle. Know the sine and cosine rules, and use to solve 2D problems (including involving bearings).	Sine, cosine, tan, angle, graph, side, angle, inverse,2D, 3D, diagonal, plane, cuboid, bound, transformations, square root, See command words.	**Starter quizzes for the term should include:** **Required prior knowledge** **Mixed skills practice** **Focused accuracy drills** **Knowledge gap support** **Look, cover, write, check.** Pupils are expected to complete purposeful exercises and repeated practice on: • Basic Trigonometry • Trigonometry calculations with exact values and boundaries • Sine and Cosine rule calculations • Finding the area of any triangle Practical problems involving selection of the correct formula. Multistep problems in a range of scenarios with reasoning, where necessary. Key & exemplar questions – WRM - SOL topics Plenary style questions – White Rose Maths - Assessment Papers	• Pearson's GCSE Maths H 9-1 Textbook: Ch5H, 13H • Purposeful Practice Book Ch5H, 13H • Edexcel Higher Linear Course Text Book Ch5, 31 • Common misconception information. Scientific calculators Sine and Cosine rule trigonometry pile up - MrGrayMaths on TES Finding Exact Trig Values - Discovery Learning - emcnicholl on TES When do we need 1/2absinc? card match - Teachit Maths	By maintaining high standards of behaviour, including mutual respect and tolerance for different ideas to their own, class teachers will be promoting British values. Throughout the year, students should be encouraged to actively listen to understand the viewpoint of others when learning involves opinions, interpretation of fact and alternative methods.

					https://www.missbsresources.com/ > Geometry> skills review Mathsbox > Topic resources > 4 Questions / Exit tickets	Trigonometry worksheets - Cleave Books Year 11 Term 1 Knowledge Organiser for key terms, recall and low stakes quizzing. Please see the Resources section for available materials on practice questions and AO1/AO2/AO3 style questions for assessment.	
N16, G11, G20, G22, G23	How can our knowledge of trigonometry help solve 3D problems?	13.d 3D Trigonometry		Understand the language of planes, and recognise the diagonals of a cuboid. Solve geometrical problems on coordinate axes. Understand, recall and use trigonometric relationships and Pythagoras' Theorem in right-angled triangles, and use these to solve problems in 3D configurations. Calculate the length of a diagonal of a cuboid. Find the angle between a line and a plane. Use the sine and cosine rules to solve 3D problems.	Pupils are expected to complete purposeful exercises and repeated practice on: • 3D Pythagoras • 3D Trigonometry Multistep problems in a range of scenarios with reasoning, where necessary. Key & exemplar questions – WRM - SOL topics Plenary style questions – White Rose Maths - Assessment Papers https://www.missbsresources.com/ > Geometry> skills review Mathsbox > Topic resources > 4 Questions / Exit tickets	• Pearson's GCSE Maths H 9-1 Textbook: Ch13H • Purposeful Practice Book Ch13H • Edexcel Higher Linear Course Text Book Ch31 • Common misconception information. Scientific calculators Year 11 Term 1 Knowledge Organiser for key terms, recall and low stakes quizzing.	**Gatsby Benchmarks: Careers** Use engagement in higher-level topics to introduce students to A-level concepts. Students might be unaware of opportunities for further study and employment with advanced mathematical knowledge. Maths, Why Bother?	MYPATH Careers Resources (mypathcareersuk.com)

						Please see the Resources section for available materials on practice questions and AO1/AO2/AO3 style questions for assessment.	
A8, A12, A13, G21	How does your knowledge of exact values support representing trigonometric functions graphically?	13.e Trigonometric graphs	Recognise, sketch and interpret graphs of the trigonometric functions (in degrees) y = sin x, y = cos x and y = tan x for angles of any size. Know the exact values of sin θ and cos θ for θ = 0°, 30°, 45° , 60° and 90° and exact value of tan θ for θ = 0°, 30°, 45° and 60° and find them from graphs. Trigonometric graph transformations are covered with Ch17 with the transformation of functions instead.		Pupils are expected to complete purposeful exercises and repeated practice on: • Drawing and reading trigonometric graphs • Using graphs to solve equations. Key & exemplar questions – WRM - SOL topics Plenary style questions – White Rose Maths - Assessment Papers https://www.missbsresources.com/ > Geometry> skills review Mathsbox > Topic resources > 4 Questions / Exit tickets	• Pearson's GCSE Maths H 9-1 Textbook: Ch13H • Purposeful Practice Ch13H Scientific calculators Graph paper Year 11 Term 1 Knowledge Organiser for key terms, recall and low stakes quizzing. Please see the Resources section for available materials on practice questions and AO1/AO2/AO3 style questions for assessment.	•
		Knowledge Recall	Big Questions of the unit are reviewed, and key areas revisited. Planned consolidation. Worded problems should be used, as well as exam style questions from the board. Further examples could include, but should not be limited to: Justify when to use the cosine rule, sine rule, Pythagoras' Theorem or normal trigonometric ratios to solve problems. Find the area of a segment of a circle given the radius and length of the chord.				Knowledge Recall Lesson – Unit 13H – Shared area. Pearson's GCSE Maths H 9-1 Textbook: Problem solving,	

						Check Up, Strengthen and Extend questions.	
		Knowledge Quiz	Knowledge Quiz and self-assessment.		Ch13H Knowledge Quiz – Shared area.		

<p style="color:red; text-align:center">Assessments for the year group will take place in Week 3 of each term, followed by feedback and focussed Pupil Improvement Time.</p>

Term 2

Topic 2: Ch15H – Equations and Graphs (4 weeks)

N8, A19, A21, A4, A11, A12, A18	What methods do we have for graphing any equations, and how can they help find solutions? Yr9 Ch6, Yr10 Ch9	15a. Linear functions	**Revision from unit 6H:** Plot, identify and interpret a linear graph given by equations of the form y = mx + c; Sketch a graph of a linear function, using the gradient and y-intercept. Find the equation of the line through one point with a given gradient; Rearrange, plot, interpret an equation of ax + by = c; Generate equations of lines that are parallel and perpendicular using the fact that the gradient of a line parallel is m and a line perpendicular is 1/m.	Sketch, estimate, quadratic, cubic, function, factorising, simultaneous equation, graphical, algebraic, inequality, intersection, variable, See command words.	**Starter quizzes for the term should include: Required prior knowledge Mixed skills practice Focused accuracy drills Knowledge gap support Look, cover, write, check.** Pupils are expected to complete purposeful exercises and repeated practice on: • Solving quadratic equations • Sketching quadratic graphs • Solving simultaneous equations algebraically • Solving simultaneous equations graphically • Expanding triple brackets • Plotting and interpreting cubic graphs. Practical problems involving simultaneous equations for contextual problems. Multistep problems in a range of scenarios with reasoning, where necessary.	• Pearson's GCSE Maths H 9-1 Textbook: Ch9H, 15H • Purposeful Practice Book Ch15H • Edexcel Higher Linear Course Text Book Ch32, 23, 25 • Common misconception information. Scientific calculators Pre-printed axes Graph transformation blitz (resourceaholic) Check-in test: transformation of curves and their equations (resourceaholic) Year 11 Term 2 Knowledge Organiser for key	**Gatsby Benchmarks: Careers** Introduce students to real examples of quadratic equations for context. Students might be unaware of opportunities for further study and employment with advanced mathematical knowledge. Real World Examples of Quadratic Equations (mathsisfun.com) Maths, Why Bother?	MYPATH Careers Resources (mypathcareersuk.com)
		15.b Quadratic Functions	**Revision** of expanding, factorising quadratic expressions and solving equations (Ch9H) Sketch a graph of a quadratic function, by factorising or by using the formula, identifying roots and y-intercept, turning point; Be able to identify from a graph if a quadratic equation has any real roots; Find approximate solutions to quadratic equations using a graph; Sketch a graph of a quadratic function and a linear function, identifying intersection points;				
		15.c Simultaneous equations (linear, quadratic and circles).	**Revision from unit 9H:** Solving simultaneous equations algebraically. Solve simultaneous equations graphically: -find approximate solutions to simultaneous equations formed from one linear function and one quadratic function using a graphical approach; -find graphically the intersection points of a given straight line with a circle; NB – Plotting and interpreting a circular graph is Ch16.				

		15.d Cubic Functions	-solve simultaneous equations representing a real-life situation graphically, and interpret the solution in the context of the problem; Expand the product of more than two linear expressions; Sketch graphs of simple cubic functions, given as three linear expressions; Use iteration with simple converging sequences.		Key & exemplar questions – WRM - SOL topics Plenary style questions – White Rose Maths - Assessment Papers https://www.missbsresources.com/ > Algebra> skills review Mathsbox > Topic resources > 4 Questions / Exit tickets	terms, recall and low stakes quizzing. Please see the Resources section for available materials on practice questions and AO1/AO2/AO3 style questions for assessment.	
A20, A22	How can we graph an inequality? 🌀 Yr10 Ch9	15.e Graphing inequalities	Revision from unit 9H: Solve linear inequalities algebraically. Solve linear inequalities in two variables graphically; Show the solution set of several inequalities in two variables on a graph. Solve quadratic inequalities in one variable, by factorising and sketching the graph to find critical values; Represent the solution set for inequalities using set notation, i.e. curly brackets and 'is an element of' notation; For problems identifying the solutions to two different inequalities, show this as the intersection of the two solution sets, i.e. solution of $x^2 - 3x - 10 < 0$ as {x: –3 < x < 5};		Pupils are expected to complete purposeful exercises and repeated practice on: • Graphing linear inequalities • Identifying critical values Multistep problems in a range of scenarios with reasoning, where necessary. Key & exemplar questions – WRM - SOL topics Plenary style questions – White Rose Maths - Assessment Papers https://www.missbsresources.com/ > Algebra> skills review Mathsbox > Topic resources > 4 Questions / Exit tickets	• Pearson's GCSE Maths H 9-1 Textbook: Ch15H • Purposeful Practice Book Ch9H, 15H • Edexcel Higher Linear Course Text Book Ch14 • Common misconception information. Scientific calculators Pre-printed axes Year 11 Term 2 Knowledge Organiser for key terms, recall and low stakes quizzing. Please see the Resources section for available materials on practice questions and	Gatsby Benchmarks: Careers Use engagement in higher-level topics to introduce students to A-level concepts. Students might be unaware of opportunities for further study and employment with advanced mathematical knowledge. Maths, Why Bother?	MYPATH Careers Resources (mypathcareersuk.com)

						AO1/AO2/AO3 style questions for assessment.	
		Knowledge Recall	Big Questions of the unit are reviewed, and key areas revisited. Planned consolidation. Worded problems should be used, as well as exam style questions from the board. Further examples could include, but should not be limited to: Algebraic iteration to be practised without early rounding. Extend the students to include expansions of more than three linear expressions. Practise expanding 'double brackets' with all combinations of positives and negatives.			Knowledge Recall Lesson – Unit 15H – Shared area. Pearson's GCSE Maths H 9-1 Textbook: Problem solving, Check Up, Strengthen and Extend questions.	
		Knowledge Quiz	Knowledge Quiz and self-assessment.		Ch15H Knowledge Quiz – Shared area.	Knowledge Quiz and self-assessment.	
	Topic 3: Ch16H – Circle Theorems (2 weeks)						
G9, G10 , A16	What are the circle theorems and how are they applied?	16.a Identifying circle theorems from Radii, Chords and Tangents. 16.b Application of circle theorems with full written reasoning. 16.c Equation of a circle.	Recall the definition of a circle and identify (name) and draw parts of a circle, including sector, tangent, chord, segment; Find and give reasons for missing angles on diagrams using facts and circle theorems, including: -isosceles triangles (radius properties) in circles; -the fact that the angle between a tangent and radius is 90°; -the fact that tangents from an external point are equal in length. -the perpendicular from the centre of a circle to a chord bisects the chord; -the angle subtended by an arc at the centre of a circle is twice the angle subtended at the circumference; -the angle in a semicircle is a right angle; -angles in the same segment are equal; -alternate segment theorem; -opposite angles of a cyclic quadrilateral sum to 180°; Understand and use the fact that the tangent at any point on a circle is perpendicular to the radius at that point; Select and apply construction techniques and understanding of loci to draw graphs based on circles and perpendiculars of lines;	Radius, centre, tangent, circumference, diameter, gradient, perpendicular, reciprocal, coordinate, equation, substitution, chord, triangle, isosceles, angles, degrees, cyclic quadrilateral, alternate, segment, semicircle, arc, theorem See command words.	Pupils are expected to complete purposeful exercises and repeated practice on: • Identification and calculations with individual circle theorems • Identification and calculations with multiple circle theorems • Plotting and interpreting the equation of a circle. Multistep problems in a range of scenarios with reasoning, where necessary. Key & exemplar questions – WRM - SOL topics Plenary style questions – White Rose Maths - Assessment Papers	• Pearson's GCSE Maths H 9-1 Textbook: Ch16H • Purposeful Practice Book Ch16H • Edexcel Higher Linear Course Text Book Ch29, 32 • Common misconception information. Scientific calculators Compasses Circle theorems meet 0.5absinC (resourceaholic) Great angle chase (resourceaholic)	•

		Tangent to a circle and gradient.	Recognise and construct the graph of a circle using $x^2 + y^2 = r^2$ for radius r centred at the origin of coordinates. Find the equation of a tangent to a circle at a given point, by: -finding the gradient of the radius that meets the circle at that point (circles all centre the origin); -finding the gradient of the perpendicular tangent; -using the given point;		https://www.missbsresources.com/ > Geometry> skills review Mathsbox > Topic resources > 4 Questions / Exit tickets	Year 11 Term 2 Knowledge Organiser for key terms, recall and low stakes quizzing. Please see the Resources section for available materials on practice questions and AO1/AO2/AO3 style questions for assessment.	
		Knowledge Recall	Big Questions of the unit are reviewed, and key areas revisited. Planned consolidation. Worded problems should be used, as well as exam style questions from the board. Further examples could include, but should not be limited to: Justify clearly missing angles on diagrams using the various circle theorem. Checks on correct notation used throughout. Justify the relationship between the gradient of a tangent and the radius. Produce an equation of a line given a gradient and a coordinate			Knowledge Recall Lesson – Unit 16H – Shared area. Pearson's GCSE Maths H 9-1 Textbook: Problem solving, Check Up, Strengthen and Extend questions.	
		Knowledge Quiz	Knowledge Quiz and self-assessment.		Ch16H Knowledge Quiz – Shared area.	Knowledge Quiz and self-assessment.	

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Term 3						
	Topic 4: Ch17H – Advanced Algebra (3 weeks)					
A4, A5, A18, N8, N9, A23, A24, A25	How can we apply our knowledge of algebraic manipulation to expressions involving powers and fractions? 🌀 Yr9 Ch2	17.a Changing the subject	Change the subject of a formula, including fractions and cases where the subject occurs on both sides of the formula, or where a power of the subject appears; **USE THE SCIENCE FORMULAE SHEET. (Equation set 1-4)**	Subject, inverse, fraction, equation, rearrange, denominator, integer, factorise, Quadratic,	**Starter quizzes for the term should include:** **Required prior knowledge** **Mixed skills practice** **Focused accuracy drills** **Knowledge gap support** **Look, cover, write, check.**	• Pearson's GCSE Maths H 9-1 Textbook: Ch17H • Purposeful Practice Book Ch17H,	•

				term, linear, Rationalise, denominator, surd, rational, irrational, function notation, inverse, evaluate, Transformations, cubic, transformation, constant of proportionality, Axes, coordinates, sine, cosine, tan, angle, graph, inverse, square root, Proof, always, identity, consecutive, integer, factor, multiple, prime, See command words	Pupils are expected to complete purposeful exercises and repeated practice on:	• Edexcel Higher Linear Course Text Book Ch18, 26, 28, 36 • Common misconception information.	
			Change the subject of a formula such as $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$, where all variables are in the denominators;		• Changing the subject • Factorising expressions • Simplifying fractions • Fraction arithmetic • Solving equations involving fractions.	Scientific calculators	
		17.b Algebraic fractions	Simplify algebraic fractions; Multiply and divide algebraic fractions; Solve quadratic equations arising from algebraic fraction equations;				
		17.c Quadratic Sequences	Continue a quadratic sequence and use the nth term to generate terms; Find the nth term of quadratic sequences;		• Identifying quadratic sequences and calculate the nth term	Algebraic Fraction (Magic Square) (resourceaholic)	
		17.d. Surds	Rationalise the denominator involving surds; simple and sign change.		• Rationalise the denominator of simple fractions	Surds arithmagons (resourceaholic) Algebraic Proof Workbook (resourceaholic)	
R14, R15, A7, A12, A13, A14, A15, A8, G21	What is a function and how do they allow you to explore more advanced algebraic concepts? 🌀 Yr11 Ch13	17.e Functions	Use function notation; Find f(x) + g(x) and f(x) – g(x), 2f(x), f(3x) etc. Including algebraically; Find the inverse of a linear function; Know that f $^{-1}$(x) refers to the inverse function; For two functions f(x) and g(x), find gf(x). Interpret and analyse transformations of graphs of functions and write the functions algebraically, (translations and reflections only) e.g. write the equation of f(x) + a, or f(x – a): Apply to the graph of y = f(x) the transformations y = –f(x), y = f(–x) for linear, quadratic & cubic functions; Revision of the Trigonometric graphs and key features (Ch13H). Apply to the graph of y = f(x) the transformations y = f(x) + a, y = f(x + a) for linear, quadratic & cubic functions; Apply to the graph of y = f(x) the transformations y = –f(x), y = f(–x) for sine, cosine and tan functions f(x). Apply to the graph of y = f(x) the transformations y = f(x) + a, y = f(x + a) for sine, cosine and tan functions.		• Rationalise the denominator with a sign change. • Use function notation • Inverse functions • Compound functions • Transform a range of functions in graphical form. Multistep problems in a range of scenarios with reasoning, where necessary. Key & exemplar questions – WRM - SOL topics Plenary style questions – White Rose Maths - Assessment Papers	Quadratic Proofs (resourceaholic) Year 11 Term 3 Knowledge Organiser for key terms, recall and low stakes quizzing. Please see the Resources section for available materials on practice questions and AO1/AO2/AO3 style questions for assessment.	**Gatsby Benchmarks: Careers** Use engagement in higher-level topics to introduce students to A-level concepts. Students might be unaware of opportunities for further study and employment with advanced mathematical knowledge. Maths, Why Bother? | MYPATH Careers Resources (mypathcareersuk.com)
A6	Why are the representations of even and an odd numbers the key to a great number of proofs?	17.f Proof	Solve 'Show that' and proof questions using consecutive integers (n, n + 1), squares a^2, b^2, even numbers 2n, odd numbers 2n +1;				

						https://www.missbsresources.com/ > Algebra> skills review Mathsbox > Topic resources > 4 Questions / Exit tickets	
		Knowledge Recall	Big Questions of the unit are reviewed, and key areas revisited. Planned consolidation. Worded problems should be used, as well as exam style questions from the board. Further examples could include, but should not be limited to: Rationalising a mixture of fractions with positive and negative signs. Explain the difference between rational and irrational numbers. Given a function, evaluate f(2). When $g(x) = 3 - 2x$, find $g^{-1}(x)$.			Knowledge Recall Lesson – Unit 17H – Shared area. Pearson's GCSE Maths H 9-1 Textbook: Problem solving, Check Up, Strengthen and Extend questions.	
		Knowledge Quiz	Knowledge Quiz and self-assessment.		Ch17H Knowledge Quiz – Shared area.	Knowledge Quiz and self-assessment.	

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	Topic 6: Ch19H – Proportion and Graphs (2 weeks)						
R7, R10, R13, R16,	How do I write, use and plot statements of proportionality? 🌀 Yr 9 Ch4, Yr10 Ch11	19.a Direct and Inverse Proportion	Recognise and interpret graphs showing direct and indirect proportion; Recognise, sketch and interpret graphs of the reciprocal function y=1/x with x ≠ 0 State the value of x for which the equation is not defined; Identify direct proportion from a table of values, by comparing ratios of values, for x squared and x cubed relationships; Use y = kx to solve direct proportion problems, including questions where students find k, and then use k to find another value; Write statements of proportionality for quantities proportional to the square, cube or other power of another quantity; **The Abbey Lens: Consider scientific contexts e.g. Gas laws** Set up and use equations to solve word and other problems involving direct proportion;	Direct, indirect, proportion, reciprocal, linear, gradient, quadratic, exponential, functions, estimate, area, rate of change, distance, time, velocity, tangent, chord See command words	Pupils are expected to complete purposeful exercises and repeated practice on: • Interpreting and reading graphs of proportional relationships. • Statements of proportionality and related calculations for direct and inverse proportion. • Plotting exponential functions • Growth and decay problems	• Pearson's GCSE Maths H 9-1 Textbook: Ch19H • Purposeful Practice Book Ch19H, • Edexcel Higher Linear Course Text Book Ch25, 34 • Common misconception information. Scientific calculators	•

			Solve problems involving inverse proportion using graphs by plotting and reading values from graphs; Solve problems involving inverse proportionality; Set up and use equations to solve word and other problems involving direct proportion or inverse proportion.		and interpretation • Interpreting gradients on linear and non-linear graphs • Calculating the area under a graphs.	Pre-printed axes Area under a graph – Toticity Gradients and	
R14, R15, A7, A12, A13, A14, A15	How do I use an exponential function?	19.b. Exponential functions	Recognise, sketch and interpret graphs of exponential functions $y = k^x$ for positive values of k and integer values of x; Use calculators to explore exponential growth and decay; **The Abbey Lens: Consider scientific contexts e.g. radioactive decay.** Set up, solve and interpret the answers in growth and decay problems;		Practical problems involving proportional and exponential relationships for contextual problems. Practical problems involving non-linear graphs including distance-time and speed-time.	Area under a curve – Collins Graphs of exponential functions - @mariomonte40 Year 11 Term 4 Knowledge Organiser for key terms, recall and low stakes quizzing.	
R14, R15, A7, A12, A13, A14, A15	What can we discern from the gradient and area under different graphs?	19.c Non-linear graphs	Interpret the gradient of non-linear graph in curved distance–time and velocity–time graphs: -for a non-linear distance–time graph, estimate the speed at one point in time, from the tangent, and the average speed over several seconds by finding the gradient of the chord; -for a non-linear velocity–time graph, estimate the acceleration at one point in time, from the tangent, and the average acceleration over several seconds by finding the gradient of the chord; Estimate area under a quadratic or other graph by dividing it into trapezia; Interpret the gradient of linear or non-linear graphs, and estimate the gradient of a quadratic or non-linear graph at a given point by sketching the tangent and finding its gradient; Interpret the gradient of a linear or non-linear graph in financial contexts; Interpret the area under a linear or non-linear graph in real-life contexts; Interpret the rate of change of graphs of containers filling and emptying; Interpret the rate of change of unit price in price graphs.		Multistep problems in a range of scenarios with reasoning, where necessary. Key & exemplar questions – WRM - SOL topics Plenary style questions – White Rose Maths - Assessment Papers https://www.missbsresources.com/ > Algebra> skills review Mathsbox > Topic resources > 4 Questions / Exit tickets	Please see the Resources section for available materials on practice questions and AO1/AO2/AO3 style questions for assessment.	
		Knowledge Recall	Big Questions of the unit are reviewed, and key areas revisited. Planned consolidation. Worded problems should be used, as well as exam style questions from the board. Further examples could include, but should not be limited to: Consider using science contexts for problems involving inverse proportionality, e.g. volume of gas inversely proportional to the pressure or frequency is inversely proportional to wavelength.			Knowledge Recall Lesson – Unit 19H – Shared area.	

			Rates of change with graphs of containers filling and emptying and price graphs.			Pearson's GCSE Maths H 9-1 Textbook: Problem solving, Check Up, Strengthen and Extend questions.	
		Knowledge Quiz	Knowledge Quiz and self-assessment.		Ch19H Knowledge Quiz – Shared area.	Knowledge Quiz and self-assessment.	
	Topic 7: Ch18H – Vectors (1 week)						
G25	How can vectors be used to solve complex geometrical problems?	18.a Vector Arithmetic including parallel vectors and scalar products. 18.b Geometric problems	Understand and use vector notation, including column notation, and understand and interpret vectors as displacement in the plane with an associated direction. Understand that 2**a** is parallel to **a** and twice its length, and that **a** is parallel to –**a** in the opposite direction. Represent vectors, combinations of vectors and scalar multiples in the plane pictorially. Calculate the sum of two vectors, the difference of two vectors and a scalar multiple of a vector using column vectors (including algebraic terms). **The Abbey Lens: Scientific vectors – momentum, velocity.** Find the length of a vector using Pythagoras' Theorem. Calculate the resultant of two vectors. Solve geometric problems in 2D where vectors are divided in a given ratio. Produce geometrical proofs to prove points are collinear and vectors/lines are parallel.	Vector, direction, magnitude, scalar, multiple, parallel, collinear, proof, ratio, column vector See command words	**Starter quizzes for the term should include:** **Required prior knowledge** **Mixed skills practice** **Focused accuracy drills** **Knowledge gap support** **Look, cover, write, check.** Pupils are expected to complete purposeful exercises and repeated practice on: • Interpreting and manipulating vectors • Vectors in context of a geometrical problem Multistep problems in a range of scenarios with reasoning, where necessary. Plenary style questions – White Rose Maths - Assessment Papers https://www.missbsresources.com/ > Geometry> skills review Mathsbox > Topic resources > 4 Questions / Exit tickets	• Pearson's GCSE Maths H 9-1 Textbook: Ch18H • Purposeful Practice Book Ch18H, • Edexcel Higher Linear Course Text Book Ch35 • Common misconception information. Scientific calculators Year 11 Term 5 Knowledge Organiser for key terms, recall and low stakes quizzing. Please see the Resources section for available materials on practice questions and	•

					AO1/AO2/AO3 style questions for assessment.
		Knowledge Recall	Big Questions of the unit are reviewed, and key areas revisited. Planned consolidation. Worded problems should be used, as well as exam style questions from the board. Further examples could include, but should not be limited to: Add and subtract vectors algebraically and use column vectors. Solve geometric problems and produce proofs.		Knowledge Recall Lesson – Unit 18H – Shared area. Pearson's GCSE Maths H 9-1 Textbook: Problem solving, Check Up, Strengthen and Extend questions.
		Knowledge Quiz	Knowledge Quiz and self-assessment.	Ch18H Knowledge Quiz – Shared area.	Knowledge Quiz and self-assessment.

Assessments for the year group will take place in Week 3 of each term, followed by feedback and focussed Pupil Improvement Time.

Terms 4-5

Topic 8: End of Year Exams and Revision

What do I need to practice and revise?

Topics this term will vary and should be based on Question Level Analysis of strengths and areas for development. These will be conducted on all previous assessments and marking for individual classes. A more detailed list will be produced closer to the time based on assessment results and analysis of the year.

However, there are common topics that students are likely to need to revisit based on Exam Results Analysis of the previous cohorts.
Some of these topic examples are listed below and should be revisited, focussing particular on the application of skills to problem solving questions.

Topics for students aiming for and working towards a grade 5+ at the end of the year:		**Additional Topics for students aiming for and wo the end of the year:**	
Venn diagrams and tree diagrams	Year 10 – Term 3	Simultaneous equations.	Year 10 –
Loci	Year 10 – Term 6	Complex ratio problems	Year 10 –
Circle Theorems	Year 11 – Term 2	Quadratic inequalities	Year 11 – T
Area and volume formula recall	Year 10 – Term 1	Gradient rates of change	Year 11 –

| | | | | Teachers should refer to the locations listed for objectives and resources, in addition to the GCSE Command words, common misconceptions and general resource bank in this document.
In addition to these topics, other activities to occur this term are:
• Drilling and repeated practice on areas where arithmetic errors are being made.
• Revisiting previous mock papers to add corrections and re-do questions that had not been studied fully yet at the time.
• Unseen practice and specification papers – as walking talking mocks, pair work or individually based on need.
• Problem solving work with a focus on literacy and multi-step questions. A mixture of past paper questions, Emporium resources, alternative exam boards and text books can be used as examples. | |

Use of Big Questions and Lesson Questions

Please refer to the department document on using Big Questions as part of The Abbey Lesson – "What does an Abbey Lesson look like in Maths?".

Big Questions are designed to build upon pupils' prior knowledge and link topics across KS2, 3 and 4. Big Questions will connect a series of learning outcomes, as opposed to focussing on individual objectives.   All students, regardless of ability will be exposed to the same knowledge within reason, but able to explore Mathematical concepts to varying depths and wider applications. The spectrum of the Big Question focus allows for this to happen. This is where Lesson Questions are used to tailor the approach, level of detail and depth of knowledge to suit the ability, attainment, and confidence of individual classes.

Common Misconceptions - Brief Notes

Ch13H.
Revision of basic Trigonometry will be required
Not using the correct rule, or attempting to use trigonometric ratios in non-right-angled triangles.
When finding angles students will be unable to rearrange the cosine rule or fail to find the inverse of $\cos \vartheta$.

Ch15H
When estimating values from a graph, it is important that students understand it is an 'estimate'.
It is important to stress that when expanding quadratics, the x terms are also collected together.
Quadratics involving negatives sometimes cause numerical errors.

Ch16H
Much of the confusion arises from mixing up the diameter and the radius.
Students find it difficult working with negative reciprocals of fractions and negative fractions

Ch17H
$\sqrt{3} \times \sqrt{3} = 9$ is often seen.
When simplifying involving factors, students often use the 'first' factor that they find and not the LCM.

Ch12H
Often students think that when a shape is enlarged the angles also get bigger.
Students struggle with the correct formal notation of congruency or similarity proof.
Students can find it challenging to see the relationship between the ratio of the measurements and the scale factor.

Ch18H
Students find it difficult to understand that parallel vectors are equal as they are in different locations in the plane.

Ch19H
The effects of transforming functions is often confused
Direct and inverse proportion can be mixed up. Square and root symbols can be missed from the defining equation

GCSE – Command Words

Please note that this table is not exhaustive but uses the most commonly used command words. These should be highlighted, explained and demonstrated when giving out problem solving work and GCSE questions.

Command word	Comments
Write down... Write...	No working will be needed
Find...	Some working will be needed but will be minimal
Work out...	Used interchangeably with 'calculate', it will be necessary to do some working out
Calculate...	Used interchangeably with 'work out' but use of 'calculate' suggests that a calculator will be needed, it will be necessary to do some workings.
Explain...	Explanation needed – may be a sentence or could be a mathematical statement
Give a reason...	Clear reasons needed; if geometrical reasons then must link into working
Draw...	Implies accuracy is important
Sketch...	Less formal than 'draw'...(no accurate measurements needed)
Complete...	Usually means that some values need filling in, for example, on a probability tree diagram or a table of values
Show...	All working needed to get to the required answer must be shown
Prove...	More formal than 'show', all steps must be present and, in the case of a geometrical proof, reasons must be given
Prove algebraically...	Algebra must be used in the proof
Describe...	Words needed to describe, for example, a transformation
Justify...	Show all working or give a written explanation
Expand...	Remove brackets
Expand and simplify...	Remove brackets and simplify
Factorise...	Straight forward factorisation
Factorise fully...	More complex factorisation, more than one factor to consider
Simplify...	Simplify the given expression
Simplify fully....	Likely to be more than one stage needed to simplify expression
Solve...	Solve an equation / inequality

General Resources Bank

Teachers will select the resources required for individual lessons. These will be fit for purpose for their class in order to promote the best progress and understanding for individual objectives, whilst still working towards the Big Question.

A **sample** list of resource materials is given as a starting point or for new ideas and are used by the department:

- Pearson's Edexcel 9-1 Textbook Series 1 and 2 - ActiveLearn (pearsonactivelearn.com)
- Pearson's Purposeful Practice book - ActiveLearn (pearsonactivelearn.com)
- MathsBox - Mathsbox
  - A wide-ranging selection of mixed quizzes, repeated practice and differentiated questions for use in the classroom, including short term cover work.
- MathsBot - MathsBot.com - Tools for Maths Teachers
  - Interactive tools and activites to aid the teaching of mathematics. Hundreds of randomly generated questions and answers and Mathematics Manipulatives for mastery.
- Corbett maths Corbettmaths – Videos, worksheets, 5-a-day and much more
  - Video tutorials, questions, revision resources and puzzles.
- Maths 4 Everyone - Maths Worksheets [Primary and Secondary] (maths4everyone.com)
  - Carefully thought-out questions that are designed for the different stages of learning a topic. Typically, there is one sheet that focuses on the First Steps, and then other sheets that contain questions which help students to Strengthen and then Extend their understanding.
- Go Teach Maths - Go Teach Maths: 1000s of free resources
  - Animated PowerPoint slides to demonstrate a mathematical method within lessons and supporting activities with an individual or paired consolidation focus.
- Maths Genie –   Maths Genie • Learn GCSE Maths for Free
  - GCSE revision videos, exam style questions and solutions.
- Oak Academy - Oak National Academy (thenational.academy)
  - Online lessons and resources to support independent study – particularly useful for students who are having to spend significant amounts of time outside of the classroom.
- Mr Barton – Variation Theory - Variation Theory
  - A collection of high-quality, sequences of questions and examples using key principles from Variation Theory. Holds questions and examples constant, together with the mathematical behaviour of *reflect, expect, check, explain*.
- Dr Frost Maths - DrFrostMaths.com
  - A diverse set of free teaching resources and tools including downloadable teaching slides/worksheets for KS3-5, teaching videos and an online platform for whiteboard practice and exam questions.
- Edexcel Exam Wizard- ExamWizard :: Index
  - ExamWizard is a free exam preparation tool containing a bank of past Edexcel exam questions, mark schemes and examiners' reports for a range of GCSE subjects.

- Additional Maths Blogs and other online resources include:

Solvemymaths	Boss Maths
Resouraholic	SavemyExams
Colleenyoung.wordpress	Nrich
missquinnmaths.wordpress	Pret Homework
Just Maths	BBC Bitesize
Mathed Up	GCSE POD
Miss B resources	

Assessments/ Quizzes / Walking Talking Mocks / Pre-Public Examinations

Through the GCSE syllabus, pupils are assessed regularly to monitor progress, understanding and make predictions.

- **Formal Graded Assessments**

Formal assessments will occur once a term, during week 3 for monitoring purposes and formal feedback. It will be a mixed topic assessment to mimic the mixed topics they will need to answer for their end of year and public examinations. It is to support a more active attitude to revision in small, manageable tasks, as well as allowing students to revisit topics in a formal setting and identify gaps in knowledge.

- **Topic Quizzes**

Other assessment will be end of unit quizzes to assess recent learning and conducted when learning of that sequence is concluded.

For an improved response to revision and independent study, students are expected to undertake guided revision tasks through the year before assessments as part of their homework.   Staff will support students with effective techniques and resources offered where required.   These revision homework tasks will consist of:
- *Directions to important online videos and tasks to consolidate knowledge or expose students to a higher-level task or topic.*
- *Pre-prepared practice questions on the relevant topics, such as the Active Learn assessment materials and Hegarty Maths.*
- *GCSEPOD with videos and related questions.*

- **Walking, Talking Mocks**

Year 11 will have a Walking Talking Mock as a method of revisiting public exam formats and good exam technique. During the WTM, the teacher will model an approach to questions on an examination paper and guide students to complete it, with a large focus on areas that students struggle with and/or do not perform their best.   Dates TBC following the publication of the exam schedule.

- **End of Year Assessments**

GCSE Public Examinations – dates to follow.

Consolidation and Review Activities

As part of each chapter of work, the students will need to undertake consolidation and review activities of their learning before moving on to new topics. This will be done as a Knowledge Recall activity.

This should consist of the following:

a.   Revisiting the Big Questions, answered with new knowledge and connections reinforced. The focus here is on questioning of students and consolidation the sequences of lessons from the chapter.

b.   Problem solving / literacy based questions with emphasis placed on highlighting key words and data, before undertaking problems as a sequence of steps. This is only if appropriate for the topic and required as additional work to lesson content.

c.   Depending out the outcome of the Knowledge Recall, students can be directed on to either the strengthen exercise for any gaps in understanding or the extension activity work.

A topic quiz will then be set to assess understanding.

Starter activities should include topics identified in PIT from earlier assessments, as well as a constant revision of previous topics for assessment for learning.

Homework

Mathematics homework is designed and set to promote students' understanding and their ability to use mathematics in a variety of situations.
Homework should be set once per week and consist of:
- Online homework through Hegarty Maths *Trial beginning in September 2021.
- Preparation and Revision for assessments and quizzes, with particular reference to the Knowledge Organisers.
- Written homework when the teacher feels it is necessary or beneficial
- Past paper practice
- Research or Investigative Tasks.

It is expected that KS4 students will undertake a minimum of 45 minutes homework per week.

All students are given individual logins to a variety of virtual learning environments, which give them access to video tutorials, practice questions and answers. The main programmes being used are: Hegarty Maths, GCSE POD, Active Learn

Most of the time, homework will support in-class learning and reinforce topics that students have studied recently within the classroom to reinforce learning and secure knowledge.

If students fail to complete homework, staff will follow procedures outlined in the Behaviour Policy.

SMSC/ ICT/ Cross Curricular Connections

The programme of study is designed to encourage the development of wider problem solving as the mathematical knowledge of the student advances. Students must look for action points and next steps that are not explicit, in order to solve increasingly complex problems.
 Lessons should :
- Value listening and respecting the viewpoint of others in problem solving.
- Promote the discussion of mathematical understanding and challenge assumption.
- Support students to question information and data that they are presented with.
- Discourage jumping to conclusions.
- Seek opportunities to build self-confidence.
- Include questions chosen based on prior lack of confidence,
- Encourage collaborative learning in the classroom – in the form of listening and learning from each other and paired discussion.
- Develop powers of logic, reasoning and explanation.
- Build competence – every student is good at something, and students struggle when connections between their strengths are not obvious or of a clear use.
- Allow choices to promote self-determination, and deal with the consequences, however minor. Giving authentic (not false) choices doesn't have to be complex—for example, choices around how to complete a multi-step problem.

Staff will seek out opportunities to encourage these values within individual lessons.

Staff should also seek out opportunities to link learning to other subjects as part of the ongoing cross -curricular cohesion project. This is ongoing but some existing links are referred to in this document as examples.   By maintaining high standards of behaviour, including mutual respect and tolerance for different faiths and beliefs and encouraging learners to respect the protected characteristics, class teachers will be promoting British values. Specific examples relating to the British Values are detailed in certain chapters.